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## **Vitae Occasional Papers Volume 2**

# **Researcher careers and culture**

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# Cultivating interdisciplinary researcher communities: The Crucible effect

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## Introduction

Early career researchers<sup>16</sup> (ECRs) battle with conflicting messages about progressing their careers in academia. While developing a track record within a defined, focused and disciplinary based research niche, they are also faced with the competitiveness of accessing funding. Funders in the UK<sup>17</sup> and other western funding systems are focusing investments in large consortia bringing together academics from different institutions, countries and disciplinary backgrounds. Accessing funding and answering challenging questions is demanding more than ever interdisciplinary collaborative approaches [Taylor, 2013]. However, the experience of carrying out research in early career stages is still mostly anchored within individual disciplines. For ECRs, engagement in disciplinary crossings and transition towards interdisciplinary research practices remains ad hoc, tends to be limited to disciplines close to their own, is ill-supported or is attempted just because the funders ask for it. Experiences of interdisciplinarity by ECRs can also be problematic, challenging and isolating [Lyall et al., 2011; Lyall & Meagher, 2012]. One discipline may invite another under false premises and the lack of understanding of what other disciplines can bring to a research problem can make the interaction uncomfortable (eg. scientists misunderstanding the contribution of social scientists). The project described here, The Sheffield Crucible<sup>18</sup> has enabled researchers to experience the power of interdisciplinary approaches early on in their careers. It intended to promote an approach where interdisciplinarity is not just an add-on, but a default position systematically considered by ECRs when developing projects.

This article describes the experience of initiating, developing and managing at the University of Sheffield a professional development programme aimed at fostering interdisciplinary collaborations between ECRs and building interdisciplinary competencies more systematically in an ECR community. It will describe how the programme was set up and experienced, the seed projects that emerged and finally, the impact the programme has had so far. This article aims to inspire researcher developers in other institutions to identify spaces within their researcher professional development programmes, where such an explorative approach could be afforded to ECRs.

<sup>16</sup> Early Career Researchers: in this context, we will be referring to researchers with a PhD working as postdoctoral research associates, research fellows and early career lecturers.

<sup>17</sup> [www.rcuk.ac.uk/funding/principles/](http://www.rcuk.ac.uk/funding/principles/)

<sup>18</sup> The Sheffield Crucible programme is not related in any way to the Sheffield Theatres. The name Crucible for the programme came from NESTA, which is a challenge in Sheffield as we host a famous theatre with the same name.

The Sheffield Crucible programme was established in order to respond to a number of developmental gaps and challenges faced by ECRs when developing research independence such as:

- isolation within own department
- being expected to know how to collaborate
- limited understanding of what it means to collaborate across disciplines
- difficulties in accessing seed funding to explore new project ideas independently from principle investigators (in the case of postdoctoral researchers)
- limited opportunities to take risky projects at the start of one's research career
- dilemmas in framing research interests in the context of narrow research funding calls and difficulties in decrypting what the funders really want.

## Developing the programme

### The Sheffield Crucible ambition

The inspiration to remediate missing steps in fostering interdisciplinary practice within ECR communities came from the Crucible programme originally developed by NESTA (National Endowment for Science, Technology and the Arts). The NESTA Crucible<sup>19</sup> aspired to create the “outward-facing researcher” and “introduce the researchers to new ways of thinking and working, with the ultimate goal of creating long-term shifts in attitude towards collaboration” [NESTA, p.5]. In developing the Sheffield Crucible programme, I was also influenced by the aspiration for interdisciplinary research described by the National Academy of Sciences [2004].

“Interdisciplinary research can be one of the most productive and inspiring of human pursuit—one that provides a format for conversations and connections that lead to new knowledge. As a mode of discovery and education, it has delivered much already and promises more ... at the heart of interdisciplinarity is communication—the conversations, connections and combinations that bring new insights to virtually every kind of scientists and engineers.” (p1 & p19)

### Programme aims

The ethos for the programme was “Imagine what you could achieve if you put your heads together”; although ambitious, the scope of such a programme was to give researchers time to think beyond their everyday practice and consider their broad engagement as scholars within their academic environment and beyond.

The programme aimed to:

- provide an environment rich in opportunities to nurture new and unexpected interdisciplinary collaborations between researchers who may not normally meet and interact
- form a local network of peers among talented and ambitious early career academics and researchers

- to consider all aspects of knowledge exchange and the social and economic implications of research, and to develop a wider view of the world of research
- to make researchers more aware of the skills and attitudes of innovators
- to enhance grant-capture opportunities.

### Programme structure

The Crucible programme (Table 1) was organised as a combination of three two-day retreats called Labs over a period of five months. This was followed by access to seed funding for interdisciplinary projects, a project delivery period of around eleven months and a fourth retreat for all original participants, whether successful or not with the seed funding. We were supported in the delivery of the programme by an experience facilitator Samantha Aspinall who had previous experiences in the NESTA Crucible. We have now run two programmes in 2012 (Crucible I) and 2014 (Crucible II). The cycle for a single programme covers a period of two academic years.

### Content of the Labs

A critical element in constructing the content of the programme was to bring a diverse and eclectic range of inputs from within and outside the university and to make the programme of interest to all disciplines. As the largest contingent of participants were from scientific disciplines, making the non-scientist participants feel at ease and valued meant paying particular attention to disciplinary balance in the types of contributors invited on the programme. Also, briefing the contributors in advance of the Lab about the diversity of the audience proved perceptible in their ability to engage all participants. Although not all contributions could be received similarly by such diverse group of researchers, they all attempted to provoke ECRs' thinking towards unusual or unexpected directions.

The narrative of the programme was about getting researchers to consider how they could engage more broadly with other stakeholders (media, public, policy, industry) as a process to consider their engagement with each other across disciplinary boundaries. Each of the residential Labs had a particular focus (Table 2) and the input and activities were based around core themes (see bullet points in Table 2).

<sup>19</sup> Further details at: <http://crucibleinbox.nesta.org.uk> (accessed 27/07/15)

<b>Year 1</b>	
September - October	Launch, recruitment, information session and application process.
November - December	Selection of participants.
March - July	Participation to three residential Crucible Labs.
August - October	Development of seed funding proposals, presentation of proposals during public event at the Festival of the Mind, contribution of the public in providing feedback on proposals and voting on which projects should be funded.
<b>Year 2</b>	
November	Committee review of proposals and announcement of successful seed funded Crucible projects.
November - September	Delivery of Crucible seed projects.
September	Lab 4 with presentations of seed projects and meeting of all previous Crucible participants.

Table 1 Timeline of the cycle for a Crucible programme.

#### Lab 1 – Looking outwards

- What role does academic research play in society?
- How and why should we engage 'the public'?
- What is the relationship between the media and research?
- How does the interface between researchers, policy and government work?
- How can my work have a social and/or economic impact?

#### Lab 2 - Your research community and networks

- How can we foster more creativity, innovation and interdisciplinary research?
- How can we bridge the cultural gap between different disciplines?
- What are the challenges in the infrastructure and culture of your institutions/companies that impede collaboration and innovation?

#### Lab 3 - Yourself

- Examining some of the individual skills and attributes that are characteristic of innovators such as: self-awareness, ability to collaborate, creativity, risk-taking

#### Lab 4- Reviewing the experience of interdisciplinary projects

- Presentations of Crucible seed projects
- Sharing of the experiences in transitioning to new approaches in collaborative practices
- Considering "next steps" in interdisciplinary workings beyond Crucible

Table 2: Contents of residential labs

Senior academics presented inspirational talks, shared their own experiences, the rewards and tribulations of getting involved in collaborations and interdisciplinary projects, in engaging with media, the public, policy and industry. These contributions reinforced the notion that broad engagement outside of academia and interdisciplinary collaborative practices are real strategic commitments of the institution. Senior academics contributors (among them several pro-vice chancellors, heads of departments, head of public engagement, head of civic university and other professors) as well as academics from the Crucible advisory group were invited to attend lunches and dinners with the participants. For some participants, having senior academics from the institution take the time to discuss and share a meal with them was particularly significant as it made them feel that their role mattered.

Including playful activities was also important in the process of building this community. We aimed for these researchers to have fun with each other in order to move towards the desire to want to work together. The playfulness was brought in through the use of quiz and games, input and performance from a storyteller, recording of the Labs by a visual artist, and challenging participants in a talent show (Lab 4).

#### Building a community

We chose to run a residential programme to anchor the ethos of 'taking time out'. By taking researchers off campus, away from the city, we were offering them a reserved space, a protected time to think and reflect away from their busy academic commitments. The atmosphere of comfort and conviviality of a hotel (usually used for weddings), helped researchers focus on engaging with each other and making the most of this precious time.



Although the hotel used is only 30 min away from the University, it provided a level of separation and allowed participants to give themselves the permission to focus on developing interactions with other Crucible participants. Providing a very comfortable and inspiring environment gave researchers a sense that the institution was investing in them and was committed to foster their professional development.

## Managing the programme

### Recruitment of participants

We were aware that the time commitment for the programme (six days plus overnight stay) was substantial and that participants needed to gain additional and tangible benefits in addition to the intrinsic motivation regarding their professional development. Highlighting the availability of the seed funding, within a context where access to research funding for ECRs is limited and extremely competitive, may have helped researchers and young academics leverage their access to the programme during negotiation with line managers.

Aware that many young researchers may be employed on various types of contracts, we advertised the scheme broadly via emails using postdoc, academic and general university mailing lists, as open to: 'ECRs and junior academics as well as early career university teachers'.

We hosted an information session and invited Crucible 'allies' in the form of previous Crucible participants: for the first programme, two researchers who had taken part in the national NESTA Crucible and for the second programme some of our Crucible I participants.

To apply for the programme researchers were required to write a formal application, where they were asked to say why they should be invited to participate and how they thought the programme could contribute to their career aspirations.

They also had to write a general summary about their scholarly work and interests, as well as work-focused activities outside research, such as public, media, industry engagement, or involvement with learned societies, researchers' societies or subject groups. In addition, we asked applicants whether they had previous experience of interdisciplinary collaborations and the types of collaborations they would envisage to develop during their participation to Crucible.

We based our selection criteria on the recommendations made by NESTA (eg. Excellence in research, demonstration of an interest and/or experience in interdisciplinary research, interest in creative thinking and breadth of collaboration, commitment to the broader role of research in society). The selection focused on establishing a mixed and balanced cohort of peers with diverse experiences, interests and disciplinary backgrounds. Some of the participants had substantial previous experience of collaboration (but not necessarily at interdisciplinary level) while for others the programme was the first venture in exploring such practice. We could not predict whether the Crucible programme would attract a diverse cohort of researchers from across our 5 faculties.

To boost recruitment, we contacted heads of department across the University and invited them to encourage the participation of ECRs and newly appointed academics, who they considered would best benefit from the programme. Because of the large financial investment in establishing such programme, the application document also required applicants to formally commit to attend the entire programme.

The applications were reviewed and selected by a cross faculty advisory group. We recruited 30 participants from 24 departments in Crucible I and 28 participants from 25 different departments during Crucible II. All faculties were represented among the participants (Figure 1). We had a low participation from the Faculty of Arts and Humanities, which may be explained by the low number of postdoctoral researchers and the intense teaching commitments of many young academics in this Faculty.

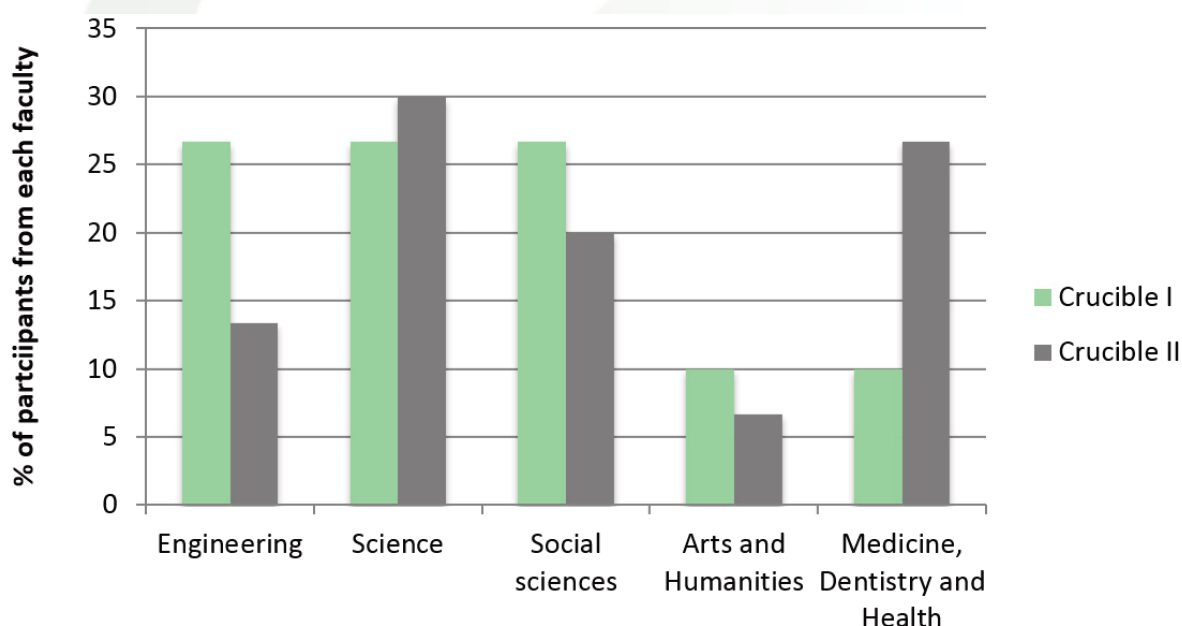


Figure 1 Percentage of participants from each faculty.

## Diversity of recruited participants

We paid attention to the cultural and gender diversity of our recruited participants. Between 33-39% of our participants were from a non-British background with participants from seven different countries in Crucible II. Within the British contingent on the programme, ethnic origins were also diverse. There was no significant gender gap in the recruitment of participants, with 53% male and 47% female participants during Crucible I. Interestingly, the proportion of women increased during the second programme with 66% female participants. The shift in the gender of the applicants was influenced by a number of elements. As I deliver the Springboard for women programme<sup>20</sup> to researchers at the University and work as a coach with alumni from this programme, I had many opportunities during the period of Crucible recruitment, to discuss with women about the uptake of such opportunity. I personally invited during face-to-face encounters a number of women who I thought could make interesting participants, or who I felt could benefit greatly from the experience.

A number of women were reticent to join the programme because of concerns related to childcare during the two days away. During Crucible II recruitment, a potential applicant expressed concerns that the programme was “not very Athena Swan<sup>21</sup> friendly”, meaning that the residential stay would put individuals with caring responsibilities at a disadvantage to participate. I was particularly committed to personally attend to such concerns. Engaging in individual discussions with potential participants and identifying flexible solutions to become enablers of participation was particularly important in setting the ethos of a supportive, diverse and welcoming environment. I made quite clear that my objective was to provide a programme that would be available for all and that I wanted to listen to specific needs and concerns. As programme manager, I was open to the flexibility needed to facilitate the participation of researchers with caring responsibilities. But I also shared with the potential applicants the perception that the residential was critical for full engagement. I felt that the residential time was needed to develop relationships between participants and to start building a community of researchers prepared to engage fully in interdisciplinary working. These discussions allowed some applicants to identify solutions for their participations and gave them confidence that we would endeavour to be flexible to facilitate their partaking.

The diversity in experiences and stages in research careers of our participants is also illustrated by the demography across research careers. The largest cohort of participants came from the postdoctoral community (40-46% between Crucible I and II), 7-14% of research fellows, 47% of lecturers in Crucible I and 29% in Crucible II, and 7-11% of researchers with other job titles (e.g. engineers, university teachers). The recruitment of research associates and fellows increased between the two Crucibles while the recruitment of lecturers diminished.

<sup>20</sup> Springboard for Women is a personal and professional development programme licenced by the Springboard consultancy. This programme is offered to all researchers in Sheffield. [www.sheffield.ac.uk/faculty/science/researchers/springboard](http://www.sheffield.ac.uk/faculty/science/researchers/springboard)

<sup>21</sup> The Athena SWAN Charter is an external accreditation process for departments/ institutions to demonstrate commitments to advancing women's careers in science, technology, engineering, mathematics and medicine careers in academia. Departments will review data, processes, policies, good practice and culture, and develop an action plan to improve the promotion of women in research careers. [www.athenaswan.org.uk](http://www.athenaswan.org.uk)

<sup>22</sup> EPSRC are the UK funding research council for Engineering and Physical Sciences and run a number of funding schemes. [www.epsrc.ac.uk](http://www.epsrc.ac.uk)

<sup>23</sup> Roberts funding' refers to a former UK research council funding stream for the personal and professional development of researchers.

<sup>24</sup> Further information on the Wellcome Trust is available at <http://www.wellcome.ac.uk> (accessed 27/07/15)

## Challenges of running the programme

### Operational challenges

Assembling a budget and building the business case to run such programme in their institutions might be one of the biggest challenges researcher developers may face. My success in accessing a diversity of internal funding to run the Sheffield Crucible programme was the result of many conversations and negotiations with colleagues across the University and working with colleagues from different sections of the University Research and Innovation Services. Being able to frame the project as addressing and delivering on multiple strategic university agenda (eg. external engagement, impact agenda, knowledge exchange, enterprise, innovation, interdisciplinarity) was a likely element in successfully accessing funding.

In the case of the Sheffield Crucible programmes, the funding came from a diversity of sources; EPSRC<sup>22</sup> Knowledge Transfer Account then later on the EPSRC Impact acceleration funds, the Research Councils Roberts' fund<sup>23</sup>, and the Wellcome Trust<sup>24</sup> Institutional Strategic Support fund. Because of the timelines in accessing funding and deadlines for funding expenditures, it does not always offer a large window of time, between knowing that you have gained sufficient funds to run a programme and putting it in place. This had implications on our ability to provide enough notice that the programme was going to take place. Academics involved in teaching will need to negotiate their teaching commitments some time in advance. For such academics, the timeline between announcing the programme and recruiting participants may not be sufficient to rearrange teaching commitments.

Running an institutional Crucible represents a risk in terms of attracting a sufficiently diverse cohort of researchers, having researchers who are formally committed to attend and do not drop out at the last minute because they are too busy. As researcher developers, we know that maintaining a high level of attendance on programmes over a long period of time can be extremely challenging for programmes run in-house. We were fortunate that retention on the programme was excellent and we only lost three participants due to personal circumstances over the two Crucibles.



## Challenges for participants

The limited length of postdoctoral researchers' contract is an issue in recruiting participants. Because the scheme represents a significant financial investment, we needed to ensure that someone joining the programme would be able to attend all the retreats and have enough time on their research contract in order to apply for the seed funding. This means in practice that you will need to have researchers who have a minimum of one year still available on their contract. If researchers are coming to the end of their contract by the time the seed project starts, then the seed funding may be able to cover their salary. In our experience, the challenges with end of contracts and potential moves between departments for the seed projects can add layers of complexities for the project manager. However, flexibility and support by the project manager can maximise the ability of some participants to take these projects forward, when contractual circumstances are not straightforward. As programme manager, being prepared to take some risks in enabling these projects to go ahead is worth considering.

Another challenge related to the recruitment of research associates is that of the time commitment they will be entitled to take towards their professional development. Taking six days over a five-month period is a significant period of time to reserve for professional development. Many researchers may find it challenging to negotiate access to such programmes with their line manager or may feel that because their contract is running out in a few months, they should focus their attention on data gathering for the project they are employed to deliver. During the first programme, we were concerned that postdoctoral researchers may find it difficult to access a programme requiring a six day commitment. To alleviate the possible challenges negotiating participation, we made the decision to strike a compromise and run one of the Labs over a weekend. In this case, only four days from the programme would be taken from their research project. It was interesting to see that the feedback from the first cohort of participants suggested that we run the programme during the week. This gave us confidence in the planning of Crucible II to 'dare' to set the 6 days of the programme during the week and acknowledge that committing to professional development as part of work commitment was a fair request.

## Experiencing the programme

Researchers joined the Crucible programme for multiple reasons, with diverse objectives and different preliminary experiences of interdisciplinary research. These quotes, taken from their applications to maintain the integrity of researchers' voices, offers insights into the objectives of a handful of participants.

"In archaeology, multidisciplinary collaboration is generally practised ... however, in many cases their activities/ studies are simply juxtaposed. I found such collaborations always very fruitful and challenging, and I learned how to see things from a number of other points of view. What I would like to do, however, is to build up a project that sees all these and others specialisations together since the very beginning, actually working together and integrating each other."

"Meet new collaborators, develop new approaches to research and gain a sense of how others in the University are dealing with the challenges of the changing environment in higher education."

"Taking the first steps in building my own independent research group. To be successful in this arena requires a network of collaborations to diversify the research you can perform. Most successful academics have established long term collaborations, which produce a long list of fruitful papers and grants. The Sheffield Crucible would provide valuable evidence to funding bodies that I can develop collaborations and form a network of useful contacts and expertise."

"The Crucible provides an opportunity to collaborate with researchers interested in issues surrounding aging and mental health, from a legal, scientific and ethical position...will increase my ability to successfully apply for research funding as it will improve not only my track record of interdisciplinary research...but also my ability to communicate my science to non-experts...will enable me to make my work more relevant to the real world and to build collaborations and network that I can continue to use throughout my career"

Participants greatly valued the opportunity to meet peers that they would otherwise never encounter and discover areas of research they were not aware of.

"The opportunity to hear about the wide range of work taking place across the university was great! There is never enough opportunities for this. The only time you get to hear things is when it's the big projects mostly done by very senior academics with huge research teams. The opportunity to be with enthusiastic ECRs was great- I felt there was little or no hierarchy that often becomes apparent in professional gatherings. It was great to be part of something where everyone was there as they were passionate about research and working with other people! Also, this made me feel like belonging to a community of researchers-sometimes research/ academic life can be very isolating and this helps to alleviate some of this."

Participants described their experience of having built and increased their academic confidence, of feeling energised by the experience, but also reflected on having expanded their academic horizon. They were aware that some of these interactions could change the potential direction of their research and careers.

## The seed projects

We incorporated into the programme the opportunity for participants to apply for seed funding (awards of £5K and £10K ) for new collaborative interdisciplinary projects with other Crucible collaborators.

The projects were framed as 'a chance to develop unexpected collaborations that would not be possible within the boundary of a single discipline.' A description of the project assessment criteria is presented in Table 3.

Interdisciplinarity	Projects must involve work utilising the expertise of two disciplines or more. We are particularly interested in unusual collaborations between disciplines that do not often work together.
Innovation	We are looking for new, original, innovative ideas or research methodologies. We are interested in experimental and/or risky projects that could lead to transformative research or new and original applications of research.
Sustainability	We intend to support projects that are not stand-alone but from which partners can extend collaborations. Projects should mark the start of new research directions that could have the potential to form substantial new research programmes.

Table 3 Crucible seed funding assessment criteria

From our point of view, the Labs with all the inputs, talks, and activities were about offering the seeds for exploration, and the funding about substantiating this new community of researchers prepared to experiment and explore interdisciplinary practices. Discussing new research ideas, exploring collaborations across disciplines, writing of a collaborative bid and then for the successful funded projects, the act of putting into practice, making these collaborations a reality enabled an opportunity for integrations of the principles of interdisciplinary collaborative practices. The experience of gaining research funding varied among participants, therefore the writing of these collaborative bids were an excellent site of peer learning [Boud, 1999]. For some ECRs who may have experienced the process of writing research proposal as a task done in isolation, the Crucible collaborative funding bids enabled feedback and collaboration. As all participants came from the same institution, the Labs provided time and space to initiate new ideas and collaborations, but some participants started to meet on campus in between Labs as soon as Lab 1 had taken place as well as during the process of writing the seed projects. The projects enabled Crucible participants to move from idea generation and a willingness of engaging in interdisciplinary practice towards a lived experience of the process of being involved in such projects.

We embedded the concept of public engagement at the core of the development of the new research projects. When the first Crucible programme took place in 2012, a large festival was being established in Sheffield: The Festival of the Mind<sup>25</sup>. This festival was the brainchild of Professor Vanessa Toulmin who had been appointed during the same period as Head of Engagement at the University of Sheffield. The Festival intended to offer opportunities for academics to engage in collaboration with creative professionals and deliver inspiring and unusual public engagement projects. We took advantage of the festival and the delivery of a public engagement became an element of the funding application process. Crucible seed-funding applicants were tasked with presenting their project proposals to members of the public in an event following the style of a 'Science fair with a twist'. The public event was called Minds Investors<sup>26</sup>, and the public in attendance was given the opportunity to vote on which project the University should invest in. We ran this public engagement element during both of the Crucible programmes.

It took place in the unusual setting of a Spiegeltent installed as part of the festival the Sheffield City Centre. In 2012 and 2014, the public event took place on busy Saturday afternoons bringing Sheffielders to encounter research in the making. For many of the Crucible participants, presenting at the Minds Investors was the first experience of public engagement. Members of the public could vote for their 5 preferred projects and provided written feedback (later shared with the applicants) to the projects they supported. In 2014, around 170 votes were cast by a visiting audience of around 400. The public vote was incorporated into the panel decision in choosing which project to fund. Projects applicants were asked to reflect on the experience of the public engagement event within the funding application document:

"The spectators present at the festival were very interested in our proposal and asked us questions or made observations that proved of paramount importance in the clarification of our final proposal for funding. Although the majority of the discussions we had with the audience were positive, there were some members of the public who questioned the concept of our project and the artistic reasoning at the basis of it. These questions proved to be extremely useful not only because by responding to them we clarified even more the conceptual framework of our project but also by providing constructive feedback they alerted us to issues that we had not considered before."

An additional element in the Crucible programme and funding scheme, was the desire to introduce researchers to the potentials of considering entrepreneurial activities. The inclusion of activities around concepts of entrepreneurship is not always well perceived in an academic community. We chose activities where researchers' interests and values were the starting point. During Crucible I, participants brainstormed concepts for the development of a mobile device 'App', which would be useful for researchers' data collection as well as for a process for public engagement. The concepts were judged by members of a local software company. The judging panel chose a concept, which was then further developed in collaboration between researchers and the company with support from Crucible funding. Furthermore, during Crucible II, participants were challenged with developing concepts for a social enterprise.

<sup>25</sup> <http://festivalofthemind.group.shef.ac.uk>

<sup>26</sup> Minds Investors 2014: [www.youtube.com/watch?v=da0iBL84byE&feature=youtu.be](https://www.youtube.com/watch?v=da0iBL84byE&feature=youtu.be) Minds Investors 2012: <https://vimeo.com/51054323>

This enabled early career researchers to explore notions about innovation and enterprise under a value framework, which might have been more compatible with their academic values. We targeted some of the seed funding for these entrepreneurial activities. I am not reporting in this article the impact for these researchers of being involved in these specific projects. I feel that considering the introduction of entrepreneurship in a context where researchers are not put off and where their individual values are maintained, made the delivery of these activities an appropriate mode of engagement.

One of the aims of the Sheffield Crucible programme was to inspire ECRs to collaborate across disciplines. Over the course of two programmes involving 58 participants, we received 38 applications for seed funding, of which we funded 18 projects. These were all new projects between researchers who had never met before taking part in the programme. The projects put forward involved between two and nine Crucible collaborators with an average of three Crucible collaborators per project.

Some projects also involved additional collaborators within and outside the University, and in one case a Crucible participant from the previous cohort. All the projects submitted, except three, involved Crucible collaborators from different faculties. For the three projects involving researchers from the same faculty, two of them were with researchers from different departments and only one project with researchers from the same department. From these three projects only one got funded with researchers from physics and psychology. Interestingly the two researchers who came from the same department had never interacted with each other before joining Crucible. This demonstrates that the programme can stimulate collaborations not only across faculties and departments, but in addition even within departments.

## Impacts of the Crucible programme

We are still at an early stage in the evaluation of the impact of the Crucible programme<sup>27</sup>, particularly in respect of those longer-term impacts commonly termed as 'Level 4' in the Impact and Evaluation Framework. [Bromley and Metcalfe, 2012]. However, clear and significant impacts are emerging.

Table 4

	Examples provided by participants
Impact on research	<ul style="list-style-type: none"> <li>• Applied or applying for larger bids based on Crucible seed projects or ideas originating from interactions</li> <li>• Taking the leadership of highlighting importance</li> <li>• of interdisciplinarity during consultation on directions and priorities of study group</li> </ul>
Impact on career	<ul style="list-style-type: none"> <li>• Successful transfers to fellowships in same or other faculties and departments.</li> <li>• (eg. Vice-Chancellor fellowships, Thomas Berry &amp; Simpson Research fellowship, British Heart Foundation Advanced Training fellowship).</li> <li>• Successful transitions to lectureships.</li> <li>• Feeling better prepared for interviews.</li> <li>• Track record of successfully applying for funding perceived as contributing factor for success with fellowships and other positions.</li> </ul>
Impact on teaching and supervision	<ul style="list-style-type: none"> <li>• Aspects of Crucible project incorporated into teaching modules: eg. law for engineers.</li> <li>• Creating additional links within the University: eg. commercialisation team, Think Ahead team<sup>28</sup>, Inkforge<sup>29</sup>, University of Sheffield Enterprise</li> <li>• Gaining PhD/ Master students as co-supervisors to follow-up Crucible projects.</li> <li>• Additional funding for student summer projects based on pilot data gained with seed funding.</li> </ul>
Impact for the University	<ul style="list-style-type: none"> <li>• Involvement of participants in the BBSRC Excellence with impact competition<sup>30</sup>.</li> <li>• Researcher gained confidence to undertake substantial media work for BBC series (eg. The Welsh body).</li> <li>• Contribution of one of the seed project to the development of expert knowledge on Intellectual Property, commercialisation skills &amp; awareness of researchers- development of activities and online resources, and collaboration with researcher developers and commercialisation teams.</li> <li>• Further contributions to public engagement activities (eg. Café Scientifique). Participation to these events also leading to broader contacts with other researchers and positively contributing to further job opportunities.</li> <li>• Gaining funding for artist in residence for the Faculty of Engineering following a seed project based on collaboration with artists.</li> <li>• Several seed projects with collaborative partners from local companies, organisations and free-lance artists.</li> </ul>
Impact on integration within the University research community	<ul style="list-style-type: none"> <li>• Feelings of being better connected within the university.</li> <li>• Initiating the development of a cross-faculty social science writing network for ECRs.</li> </ul>

<sup>27</sup> Short interviews of previous participants about their experience of the programme are available at: [www.youtube.com/watch?v=Y9ldFOF-IBQ](http://www.youtube.com/watch?v=Y9ldFOF-IBQ)

<sup>28</sup> Think Ahead team is the team responsible for the Researcher Development Programme at The University of Sheffield: [www.sheffield.ac.uk/ris/ecr/mission](http://www.sheffield.ac.uk/ris/ecr/mission)

<sup>29</sup> Inkforge is a programme aimed at embedding the development industrial knowledge into researcher development: [www.sheffield.ac.uk/faculty/medicine-dentistry-health/thinkahead/inkforge](http://www.sheffield.ac.uk/faculty/medicine-dentistry-health/thinkahead/inkforge)

<sup>30</sup> [www.sheffield.ac.uk/bbsrc-ewi](http://www.sheffield.ac.uk/bbsrc-ewi)



So far, we have collected evaluation data in a number of ways; ethnographic notes based on observations and conversations during the Labs, presentations done by Crucible participants about taking part in the programme or informal meetings and discussions with participants, formal feedback forms at the end of the programme, visual representations created by participants about the impact of the programme and end of seed-project reports. The second round of seed projects are currently underway and the final Lab 4 for Crucible II will take place in September 2015.

In terms of the personal and professional development of researchers, it is clear the programme had a number of beneficial impacts:

- young researchers were able to take steps towards research independence by gaining research funding independently from their principal investigator
- the programme supported the engagement of researchers with external partners
- impacts at an individual level e.g. career progression
- impacts at an institutional level e.g. development of institutional networks.

The Crucible programme had several levels of impacts; some examples are summarised in Table 4 (above)

The programme has inspired not just a minority of scholars but the majority of the programme participants to explore interdisciplinary projects. Over the two Crucible programmes, 88% of participants were involved in submitting seed projects. Researchers were involved in multiple submitted projects either as principle investigator, co-investigator or collaborator. Although not all projects were successfully funded, the majority of Crucible participants were able to experience the process of developing a new and interdisciplinary seed funded project and in some cases were involved in several successfully funded seed-projects (maximum of four successful projects for one individual). Only nine researchers (17.6%) among those who had submitted seed projects were not involved in a successful seed-funding project. Although this was a shame for the individuals concerned, it was important that the selection of funded projects reflected the realities of the competitiveness of accessing research funding. The cross-faculty Crucible advisory board, who selected the seed projects emphasised the need to maintain a high level of competitiveness to access the Crucible funding.

## Conclusion

As a professional development model aimed at building interdisciplinary communities of ECRs across campus, the Crucible has demonstrated great strength in creating a structure, where researchers are enabled to take some time out to consider their research interests within a broader context, and the research interests and methodologies of other researchers and disciplines. It has succeeded in building a community of scholars daring to start working across disciplinary boundaries, beyond their current experience and comfort zone.

The Crucible programme has enabled researchers to understand what engagement beyond the research community could mean and to decipher some of the new demands placed on academics to demonstrate the impact of research. The positive attitude fostered during the programme in cultivating engagement with other communities whether other disciplines, public, media, policy and multiple other stakeholders could help researchers at the start of their academic careers feel empowered to respond to the many demands placed on them.

The Crucible has helped break some of the isolation experienced by young academics and it has demonstrated that you can foster the desire to work across disciplinary boundaries, bringing a multitude of impacts for the individuals and the university. There remains to address whether the programme is able to impact in the longer term upon interdisciplinary practices. We will need to identify the challenges faced by researchers in continuing such an approach. Although funders promote interdisciplinary approaches, the perception and assessments made by departments and recruitment panels of researchers exploring these approaches might be more problematic. The study of these longer term impacts will help us build a better understanding of successful approaches to foster interdisciplinary working.

One of the great advantages of having run the Crucible as an institutional programme was that the Crucible network was able to gain momentum and build itself over a period of seven months between the first Lab and the funding applications. Participants met across the campus in between Labs to carry on some of the discussions. They particularly valued this institutional network. It also offered a sufficient amount of time for new research ideas to develop and crystallise. Because of the open nature of the seed funding with no pre-defined thematic, in contrast with the IDEA factory of the EPSRC<sup>31</sup>, researchers needed sufficient time to develop ideas and find common grounds and territories, such that projects could mature and not just be patched up together just for the sake of available funding. That's what you may call 'slow cooking'.

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<sup>31</sup> [www.epsrc.ac.uk/newsevents/pubs/welcome-to-the-ideas-factory-home-of-innovation-since-2004/](http://www.epsrc.ac.uk/newsevents/pubs/welcome-to-the-ideas-factory-home-of-innovation-since-2004/)

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